CS469073

Design for Manufacture and Assembly (DfMA) and Modular Prefabrication – Methods for Workforce Training

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Learning Objectives

- Apply generative design, automation, and modular assembly to construction DfMA fabrication processes.
- Employ Revit, BIM 360, and Navisworks for DfMA production and workforce training.
- DfMA training techniques for prefabrication of modular assemblies.
- Training personnel performing DfMA and modular assembly fabrication for construction projects.

Description

Design, fabrication, and manufacturing for construction is advancing in the piping industry at a rapid pace. As such, workforce training for using the latest available technologies with the latest advances in design is essential. In this class, we'll explore design for manufacture and assembly (DfMA) workflows and methods and the application to United Association training for improving the DfMA and modular assembly fabrication and installation skills of installers of mechanical piping and plumbing systems. We'll be exploring generative design, modular assembly techniques, and automated tools, including their integration with Revit software, BIM 360 software, Navisworks software, and STRATUS, to develop modular fabrication training processes and methods.

Speaker(s)

John Russell

John started his career in 1980 as a member of the United Association Plumbers & Pipefitters Local 5 in Washington, D.C. He has extensive experience as a virtual construction coordinator/detailer as well as over eighteen years of experience in the supervision of virtual design and construction coordination departments. John has been an instructor since 1989 teaching Applied Drawing, BIM, VDC, AutoCAD, Revit, Autodesk Fabrication, Navisworks, and BIM 360. He has also been an instructor at the UA Instructor Training Program since 1991 teaching these subjects to current UA VDC instructors. Additionally, John is a member of the UA VDC group of instructors who share a common goal to promote the development of a UA curriculum by utilizing BIM and advanced jobsite technologies.

Diana Lee

Diana Lee is a member of the United Association of Plumbers, Pipefitters, Sprinklerfitters and Service Techs in Wisconsin. She holds a journeyman card as a steamfitter and a BFA in communication design. Her decade of experience in construction ranges from hydraulic tank manufacturing and pipe welding in fabrication shops - to VDC manager for multi-trade contractors. Diana is a member of the United Association's national VDC group of instructors, who share a common goal to promote the development of UA curriculum utilizing BIM and other advanced jobsite technologies. She currently works as a Revit instructor and virtual design administrator for training schools in her region.

About the UA

The United Association of Journeymen and Apprentices of the Plumbing and Pipefitting Industry of the United States & Canada (UA), affiliated with the national building trades, represents approximately 356,000 plumbers, pipefitters, sprinkler fitters, service technicians and welders in locals across North America. We also honor a federation agreement with both the Australian Plumbing Trades Employees Union (PTEU) and Irish Technical, Engineering and Electrical Union (TEEU).

UA Training

The UA has been training qualified pipe professionals longer than anyone else in the industry. We boast these premier training programs available today:

- **Instructor Training Program (ITP):**
  - The UA's well-respected and highly effective college accredited program of instructor education.
- **Certifications:**
  - Our certifications guarantee our contractors and users that the craftsmen they hire have been tested and meet the highest standards.
- **College Degrees:**
  - All UA members are eligible to earn a wide variety of college degrees as part of their training.
- **Construction Supervision:**
  - UA members who wish to move into a construction management position can become certified supervisors.
- **Accelerated Welder Training and VIP Program:**
  - This program is an 18-week intensive curriculum that prepares members to be certified in specific welding procedures.

UA Technology Training

United Association BIM/VDC Training Courses

- Revit
- AutoCAD Fabrication MEP
- DfMA and Modular Fabrication
- BIM 360
- Laser Scanning
- Virtual & Augmented Reality
- Total Robotic Station
- Drone Applications

What is DfMA?

DfMA is the combination of two methodologies:
Design for Manufacture, which means the design for ease of manufacture
of the parts that will form a product, and
Design for Assembly, which means the design of the product for ease of assembly.
Wikipedia

Design for Manufacture and Assembly (DfMA) is a *design* approach that focuses on ease of *manufacture* and efficiency of *assembly*.
By simplifying the *design* of a *product* it is possible; to *manufacture* and *assemble* it more efficiently, in the minimum time and at a lower *cost*.
Designing Buildings Wiki (UK)

DfMA and Mechanical Installation

Designing for the manufacture of fabricated piping/equipment modules and assemblies will allow efficiency of manufacture and assembly of mechanical piping and plumbing systems within buildings.

- Prefabrication of piping and equipment are our manufacturing processes
- The installation of prefabricated piping assemblies and modules within buildings
  are our assembly processes

Simplifying the *design* of piping and equipment modules

- Allows faster and more efficient fabrication
- Allows faster and more efficient field installation of the fabricated modules

DfMA concepts are applied to mechanical piping and equipment installation workflows through prefabrication processes.

Application of DfMA to Prefabrication Processes

PARAMETRIC & Generative Design

Design of spool assemblies and modular assemblies must reflect efficiency and economy in fabrication time and use of materials.

Modularization

Fabrication of modular assemblies consisting of prefabricated spool assemblies allows ease of field installation

Automation (Robotics)

Automating tasks for fabrication of spool assemblies and modular assemblies increases productivity and accuracy

Workforce Training

Training for the Future

- Generative Design for buildings will affect the way piping is designed and installed
- Modular assembly is already being used in the Mechanical industry - future application will increase
- The use of automation and robotics will greatly affect the pace of the construction industry

How are we Training for DfMA in Mechanical Installations?

PARAMETRIC & GENERATIVE DESIGN

- Training in 3D modeling utilization and production
- Revit, Dynamo and Generative Design for Revit classes
- Navisworks Manage clash detection
- BIM 360 training

MODULAR CONSTRUCTION

- Multi-trade module design
- Multi-trade module manufacturing and coordination
- Multi-trade module installation methods

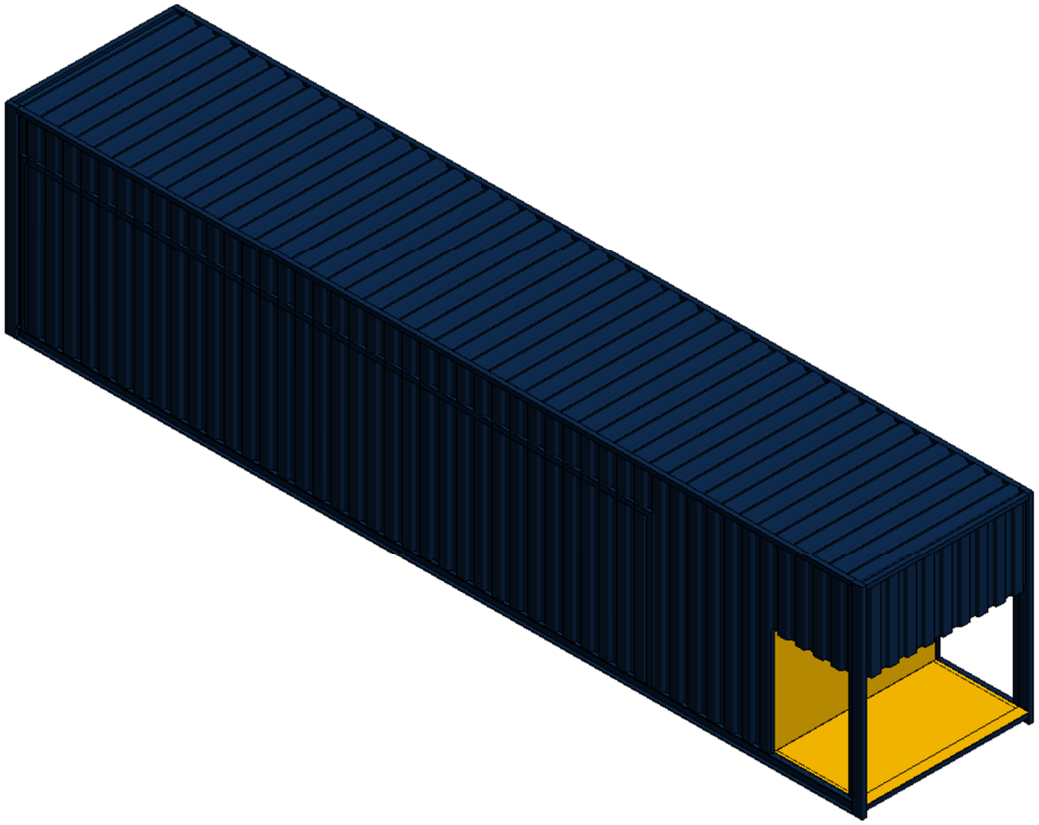
AUTOMATION

- Training in use of automated fabrication tools (TigerStop, PypeServer, etc)
- Training for use of jobsite robotic tools

The UA Fire Protection Training Module

UA Fabrication Training Container

MOBILE Training Unit



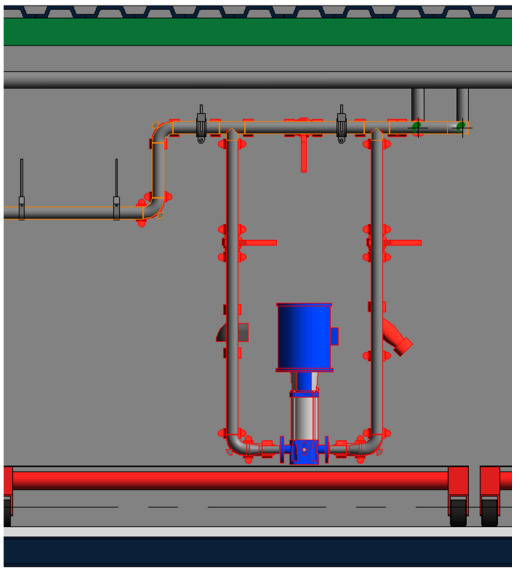
- Interchangeable prefabricated training module for piping and equipment assemblies

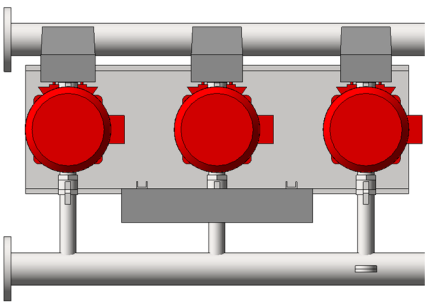
- Assemblies are stored in a freight container for transport to UA regional training centers and local union training facilities

UA Training Modules

- Process Piping
- Centrifugal Pump Skid
- Water Heater and Lavatory
- Refrigeration Module
- Metering Devices

  ...many options for our industry





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